Advant® OCS
with Master software

Advant Controller 110

Version 2.2

Product Guide

3BSE 016 141R0001

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Chapter 1 Overview

Advant Controller 110 is a highly modular controller for logic and regulatory control for midsize applications. It is offering a full complement of control and communication functions and it is designed to suit a wide range of industrial applications, from small to medium-size, from logic to loops, either stand-alone or as an integrated part of an Advant OCS system as well as in any other distributed control system.

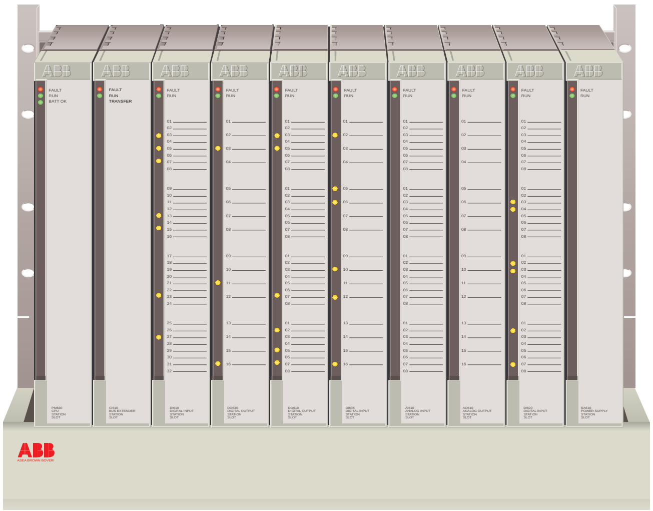

Figure 1-1. Advant Controller 110 with S600 I/O mounted in a subrack

1.1 Product Benefits

Advant Controller 110 is specifically designed for high-speed PLC-type applications, but brings also considerable problem-solving power to all analog signal handling and arithmetic applications. It is perfect to live and grow with, thanks to its multitude of expansion possibilities and its on-line programming capability. Advant Controller 110 also includes handling of analog signals for loop control, binary and arithmetical application and it is designed to operate in demanding industrial environments at low cost.

1.2 Features

Advant Controller 110 covers a wide range of functions such as:

- Logic and sequence control.
- Analog data handling.
- Arithmetic, pulse counting and regulatory control.
- Support of true sequential event recording thanks to accurate at-the-source, time tagging of events.
- Support of a wide range of central and distributed I/O modules for maximum configuration possibilities, with a recommended maximum capacity of some 1500 I/O points.
- Support of local and central HMI for manual control operations, event and alarm handling, trend curve presentation etc.
- Built-in RS 232 interface for MODBUS I or RCOM.
- Support of Advant Fieldbus 100, and prepared for cable redundancy.
- Support of PROFIBUS-DP.
- Support of RCOM/RCOM+, Siemens 3964R and MODBUS I.
- Configurable directly connected or remotely via RCOM or Advant Fieldbus 100.

Chapter 2 Functional Description

2.1 Controller Basics

2.1.1 Start-up of the Controller

Start-up of the Advant Controller 110 can be done in four ways:

- Stop
- Clear (cold start)
- Auto (warm start)
- Diag.

In stop mode, the controller does not activate any application. It waits for commands from a connected engineering station.

In cold start mode the controller also performs its self-tests, checks the user flash PROM for a valid application and activates this application. Next, complete initialization and I/O module configuration are performed.

In warm start mode, in case of a power failure and valid RAM content, the controller checks the parameters of I/O modules, configures the modules if necessary, and continues execution of the application from the point of interruption.

In diagnose mode, the controller only performs its self-tests and reports if there is a fault (only supported in some processor modules).

2.1.2 Process Control

Program entry, testing, documentation and fault tracing are supported by Advant Station 130 Engineering Station. Advant Station 130 Engineering Station is an IBM PC-based programming and service tool. It features graphical function chart programming and a user interface with windows, pull-down menus and “point and click” selection.

Communication with Advant Controller 110 is accomplished via a standard serial interface from the personal computer.

An application program for an Advant Controller 110 consists of a DB part and a PC program. The DB part and PC program cannot be loaded separately.

Process control applications are programmed in ABB Master Programming Language (AMPL). AMPL is a function-block language with graphic representation. It has been developed for process control applications.

The building blocks are called PC elements. There is a range of PC elements, from simple AND blocks to complete PI regulators. The controller can be programmed in AMPL fully on-line, that is, with the program running and controlling the process. Cycle times of the PC programs are selectable in the range from 2 ms to 20 s in steps of 2 ms.

The PC program has access to process variables via DB elements. These elements also contain all I/O system configuration information. Configuring the S600 I/O system involves filling in DB elements with parameters for each I/O module and channel. Typical parameters are tag name, signal range, filter time, etc.

Analog and digital I/O modules are scanned cyclically with the cycle time of the PC programs (PCPGM, CONTRM, SEQ, MASTER). The S600 I/O modules deliver values that are already scaled and filtered so that the processor module is not concerned with scaling and filtering.

All information to/from S800 I/O modules is exchanged cyclically over Advant Fieldbus 100 between the I/O modules, via CI810, and the bus interface CI626/CI627. From the fieldbus interface the data is fetched by means of cyclic scanning.

Diagnostic functions supervise the system at start up and during normal operation. The status of the modules are indicated by LEDs and are also accessible by terminals on the DB element.

PC Elements

The range of ready-to-use PC elements is wide and powerful. It contains elements for:

- Logic Control
- Time Delays
- Sequence Control
- Data Converting
- Calendar Time Functions
- Arithmetic
- Regulatory Control
- Pulse counting

The different PC elements are listed under the program modules in Chapter 3, Software Components.

User Defined PC Elements

Another way to implement your frequently used control solution and ensure a fully integrated engineering environment is to make use of the option for creating own PC elements.

A user defined PC element appears in every sense as a standard PC element.

2.2 I/O System Support

The following I/O’s are supported by Advant Controller 110:

Analog Inputs

- Different analog inputs are available. Both single ended and differential inputs, with or without live zero, can be connected to a controller in the Advant Controller 100 Series.
- Values are represented by 0 - 100%
- All modules are self calibrating and have 12 bit resolution.

Pt 100 Inputs

- All values are used in the system as engineering units, selectable between degrees Fahrenheit and Celsius.
- Temperature ranges:
  -200…+600 ^{o}C for Pt 100 or
  0...500 Ω for resistive pick ups.
- The suppression frequency is selectable between 16 2/3, 50 and 60 Hz.

Thermocouple Inputs

- All values are used in the system as engineering units, selectable between degrees F and C.
- Thermocouple inputs are available for the sensor types B, C, E, J, K, N, R, S and T
- Automatic testing and self calibration is provided within the module.

Analog Outputs

- Analog outputs of different types are available, with or without live zero.
- Values are represented by 0 - 100%.

Digital Inputs

- Some modules offer sequence of event handling, which means that events are detected and time tagged on the input module.
- Some modules offer pulse extension, which can be used to avoid the need of rapid scanning of digital inputs used for push-buttons

Digital Outputs

- Modules for different input voltages and load currents are provided both with solid state outputs and relay outputs.

Pulse Counters

- Supports various operation modes such as up/down counting, frequency difference, position and rotational speed measurement to frequencies up to 100 kHz.

2.3 Communication

Detailed information about the various networks and buses that can be integrated in Advant Controller 110 is given in the Product Guide for Advant OCS with Master Software, Overview. The user interface and the handling of it are described in further individual User's Guides.

Below is a list of communication functions in Advant Controller 110.

Fieldbus Communication

- Advant Fieldbus 100
  Communication is done with Data Set Peripherals (via CI626 or CI627)

- PROFIBUS-DP
  Communication is done with database elements PB (via PM634 with integrated PROFIBUS-DP interface)

- RCOM/RCOM+
  Communication is done with MVI Sets (via MultiVendor Interface (MVI) CI532V01 or directly on the second serial interface of AC 110 CPU module)

- Master Fieldbus
  Communication is done with PC elements (via CI670 or CI671)

External Communication

- MultiVendor Interface (MVI)
  Communication is done with MVI Sets

  The following protocols are supported:

  – MODBUS (via CI532V02)

  – Siemens 3964(R) (via CI532V03)

  – RCOM/RCOM+ (via CI532V01)

- MODBUS
  Communication is done directly via second serial interface of AC 110 CPU module

2.4 Event Handling

Advant Controller 110 supports event detection and transfer of time-tagged events to the Advant Controller 400 Series, another Advant Controller 110 or the AdvaSoft via Advant Fieldbus 100 or RCOM.

A time-tagged event is generated when a signal changes in a pre-defined way, provided the signal is configured for event detection. Events are time-tagged when detected.

There are four kinds of time-tagged events, depending on their source:

- Events from I/O modules DI650/DI651/DI652. These events are time tagged directly on the input module.
- “Calculated” events are detected by DB elements DIC and AIC, which watch connected PC variables of boolean or real type for events. Event detection is “calculated” according to the parameters specified at these DB elements with a resolution down to 10 ms.
- Events generated by the Extended DB elements. The event detection is similar to DIC and AIC.
- Events from MP40. These events are received from MP40 in MVI Data Blocks (MVB) and converted by means of DB elements DIMVB (events of digital type) and AIMVB (events of analog type) into the internal event format.

2.5 Time Synchronization

The time synchronization facility enables the cyclic synchronization of the internal clocks of Advant Controller 110 stations within one Advant Fieldbus 100 system or via RCOM.

A resolution of 100 microseconds and an accuracy of 15 milliseconds is achieved.

The Advant Controller 110 can be configured either as time slave to be synchronized or as time master to be the distributor of the time on the network.

In addition on Advant Controller 110 an external synchronization is possible by a “minute pulse” input on the hardware of the processor module (PM633 and PM634 only).

2.6 Central Operator Station

Communication with a central operator’s station, AdvaSoft for Windows, is possible via Advant Fieldbus 100.

To support AdvaSoft for Windows the Advant Controller 110 software option OPT3 Event Handling is necessary. Beside this option no additional software options are necessary to support AdvaSoft for Windows.

2.7 Local Operator

2.7.1 Local Operator Station

The local operator station communicates with Advant Controller 110 via the MODBUS (RTU) protocol on the serial interface of the processor module. The master of this communication link is on the operator station / MMI side.

Advant Controller 110 is the slave with the fixed slave node number 1.

The MODBUS facility can be enabled on the Advant Controller 110 with the software option OPT4 MODBUS I.

2.7.2 Panel

Panel units supporting MODBUS I protocol can be connected to the processor module on the second serial interface. With an easy mechanism of data exchange it is possible to work with:

- numeric displays
- keyboards
- function keyboards
- push buttons
- thumbwheels.

2.8 Extended DB Elements

Extended DB element is a concept that eases the engineering phase of an Advant Controller 110 network. It addresses three issues:

- Definition of a signal mostly independent of the I/O hardware.
- Definition of a signal for HMI (AdvaSoft) purposes. Every aspect of the signal, from DSP communication up to event generation can be seen at one single DB element.
- Distribution of signals in a network. There is only one point in the system where the signal is defined, including the conversion of raw values to engineering units.

2.9 Function Table

A large variety of configuration alternatives is possible with Advant Controller 110 and its I/O, both software and hardware. Software options are available as one or several program modules. Optional hardware units are I/O boards, communication interfaces etc. Table 2-1 summarizes the various options and configuration alternatives applying to Advant Controller 110.

Table 2-1. Functions and configuration alternatives for Advant Controller 110

Function	Program module	Hardware	Peripherals
PC elements for logic, arithmetic & data handling	AC110 Base SW	PM632/633/634	
PC elements for regulatory control	OPT1 Extended PC elements	PM632/633/634	
User defined PC elements	Extension Disk	PM632/633/634	
On-line AMPL program editing	AC110 Base SW	PM632/633/634	AS 100 Series engineering station
Event Handling	OPT3 Event Handling	PM632/633/634	
S600 I/O modules support	AC110 Base SW	See Ordering section	
S800 I/O modules support	AC110 Base SW	See S800 I/O Product Guide	
PROFIBUS-DP	AC110 Base SW	PM634	
Advant Fieldbus 100	AC110 Base SW	CI626/627	
MasterFieldbus	AC110 Base SW	See Ordering section	
RCOM/RCOM+ (via MVI)	OPT2 MVI Handling	CI532V01	
Modbus I (via MVI)	AC110 Base SW	CI532V02	
Siemens 3964 (R) (via MVI)	AC110 Base SW	CI532V03	
Support for AdvaSoft for Windows	AC110 Base SW; OPT3 Event Handling	See corresponding Product Guide	AF 100
Local operator station (on-board Modbus I interface)	OPT4 MODBUS I	PM632/633/634	MODBUS - MMI
on-board RCOM interface	OPT5 RCOM Driver	PM632/633/634	

Table 2-1. Functions and configuration alternatives for Advant Controller 110 (Continued)

Function	Program module	Hardware	Peripherals
Object support via Advant Fieldbus 100 (Extended DB elements)	AC110 Base SW	PM632/633/634	
PROM back-up of application program (PC and DB part)	AC110 Base SW	PM632/633/634	

Chapter 3 Software Components

The software system for Advant Controller 110 is built around one basic program module to which alternative optional program modules can be added. The optional program modules can be combined in any combination to solve the application task. A description of the program modules and a specification of their contents follow.

3.1 Basic Program Module

The Advant Controller 110 system software includes a real time operating system, an AMPL element library, diagnostic functions and interfaces to engineering and operator stations. The application program is stored in a nonvolatile memory. At start-up it is copied from the nonvolatile memory to the RAM memory where it is executed.

The application program consists of one AMPL program (one PCPGM), and up to 31 subordinate execution units (CONTRM, SEQ or MASTER). These are executed cyclically with execution times selectable from 2 msec to 20 s. It is also possible to define subordinated execution units (CONTRM) that are executed once at cold start or warm start. The start-up sequence can be defined by the user.

Diagnostic functions monitor the system operation and report any fault found. The monitoring functions include a watchdog, bus supervision and memory checking.

Faults are indicated on the diagnostic display on the front of the module and via a relay contact. More detailed diagnostic information can be obtained with an Advant Station 130 Engineering Station.

To simplify the configuration and reducing the engineering work of connections to AdvaSoft for Windows stations, extended DB elements are available. This means that all relevant configuration can be done with one single element.

The basic program module has a functional content in accordance with:

- Logic control and time delays
- PROFIBUS-DP communication (Supported on PM634)
- Advant Fieldbus 100 communication
- Sequence control
- Connection to Advant Controller 400 Series
- Calendar time functions
- Connection to TYRAK and SAMI
- Arithmetic.

Most of the mentioned functions are realized with one or several PC elements. The contents of the PC element library in the basic program module is shown in Table 3-1.

Table 3-1. PC elements in the basic program module

Type	PC element
Structure	PCPGM, CONTRM, FUNCM, MASTER, SLAVEM, BLOCK, SEQ, STEP
Logic	AND, AND-O, OR, OR-A, XOR, INV, TRESH-L, SR, SR-AA, SR-AO, SR-OA, SR-OO, SR-D
Arithmetic	ADD, ADD-MR, SUB, MUL, MULDIV, DIV, DIV-MR, ABS, SQRT, LIM-N
Time	MONO, TON, TOFF, TON-RET, TRIGG, AND-TRG, OR-TRG, OSC-B, TIMER, SYSTIME
Registers	FIFO, MOVE, REG, SHIFT
Multiplexers	MUX-I, MUX-MI, MUX-MN
Code converters	CONV, CONV-BI, CONV-IB, BGET, BSET
Counters	COUNT
Comparators	COMP-B, COMP-I, COMP-R, MAX, MIN
Switches	SW, SW-C
MasterFieldbus	COM-CVI1, COM-CVO1, MFB-IN, MFB-OUT
Supervision	SYSL

3.2 Optional Program Modules

3.2.1 OPT 1 Extended PC Elements

The optional program module OPT1, Extended PC Elements extends the PC element library included in the basic program module with PC elements for supporting the function Regulatory control. The contents are shown in Table 3-2

Table 3-2. Additional PC elements in program module OPT1

Type	PC element
Registers	REG-G
Function generator	FUNG-1V
Filter	FILT-1P
Feedback	P-1, INT, DER, PI, PIP, PDP, CON-PU1, RAMP

3.2.2 OPT 2 MVI Handling

In conjunction with the MVI module CI532V01, V02 or V03, the optional program module OPT2, MVI Handling extends the functionality of the controller with the following communication facilities.

- RCOM/RCOM+
- Siemens 3964(R)
- MODBUS

NOTE

The MVI module provides two channels. Each channel can operate both in master and slave mode. Do not run slave mode on both channels simultaneously.

3.2.3 OPT 3 Event Handling

Optional program module OPT3, Event Handling extends the functionality of the controller with event handling according to the following:

- Detection of events from digital or analog output terminals (calculated events)
- Handling of events from modules DI65x
- Event handling and event transfer via Advant Fieldbus 100
- Event handling via RCOM/RCOM+ (requires also OPT2 software)
- Time tagging of events
- Transit of events
- Event Handling with Extended DB elements.

3.2.4 OPT 4 MODBUS I

Optional program module OPT4, MODBUS I extends the functionality of the controller with the MODBUS I protocol (RTU, binary mode), intended for communication with an IBM PC based HMI package. Advant Controller 110 can be used **only as slave** with the fixed address 1 on MODBUS. The separate serial interface on the processor modules is used for this purpose. The following MODBUS functions (read/write commands) are supported:

- 01 = Read coil status
- 06 = Load single register
- 02 = Read input status
- 07 = Read exception status
- 03 = Read holding register
- 08 = Diagnostic loop-back
- 04 = Read input register
- 15 = Force multiple coils
- 05 = Force single coil
- 16 = Load multiple registers.

3.2.5 OPT 5 RCOM Driver

Optional program module OPT5, RCOM Driver enables the processor module to communicate via the RCOM/RCOM+ protocol using the processor module’s CH2 connector. You do **not** need a separate MVI module.

3.3 Further Extension, EXT

A dedicated diskette including all necessary items as extension loader, interface library and a detailed descriptive manual can be obtained to create and load application specific AMPL elements in addition to the Advant Controller 110 system software. Commercially available tools as compiler, linker, loader and assembler must be purchased separately.

Chapter 4 Hardware Components

4.1 System Unit Overview

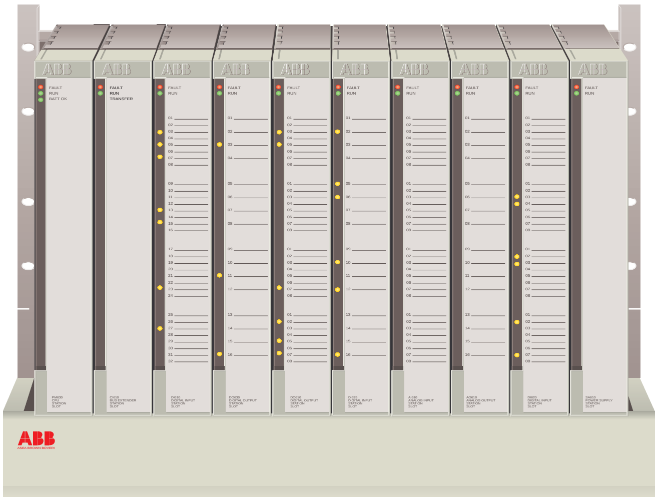

Figure 4-1. Advant Controller 110, Controller Subrack

The hardware for Advant Controller 110 consists of processor modules, communication modules, I/O modules and process connector, subracks, cable ducts and power supplies. The subracks and cable duct are designed for wall mounting or mounting in cabinets. Normally they are mounted in cabinets. The modules are housed in a sheet-steel enclosure which protects the circuit boards. The enclosure has openings at the top and bottom for air convection. It meets the IP20 protection class of IEC 529.

4.2 Basic Unit

The basic unit for an Advant Controller 110 consists of the units according to Table 4-1.

Table 4-1. Basic unit for Advant Controller 110

Units	Description
RF615	Subrack
RC610	Cable duct
BASE	Basic system software

The basic unit can be used with either processor module, PM632, PM633 or PM634.
The controller may consist of one or two subracks. When two subracks are employed and power is obtained from a plug-in supply module, as shown in Figure 4-2, there are up to 18 positions left for I/O (with PM634 up to 17), resulting in a maximum number of 576 I/O signals.
The following rules apply for configuration:

- The two subracks must be put in the same cabinet.
- The power supply terminals (USA, USB, ZD) of the two subracks must be linked.
- The processor module must always be put in position 1 in the controller basic subrack. If Advant Fieldbus 100 is used, the Advant Fieldbus communication modules must be put in the same subrack next to the processor module.
- If I/O stations are connected, the bus extender module CI615 should be put next to the processor module.

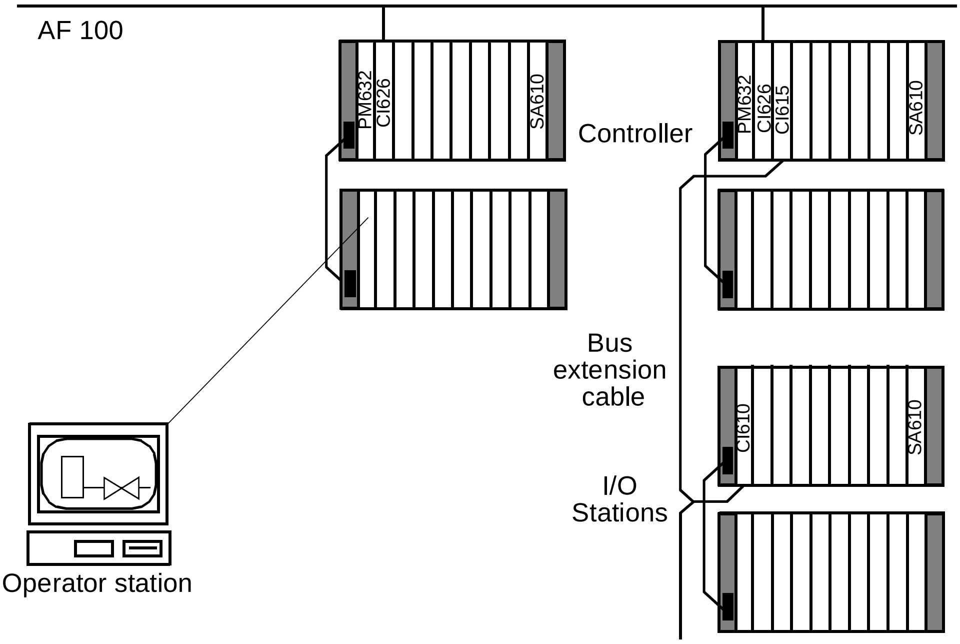

Figure 4-2. Overview of the Advant Controller 110 system structure

4.3 Processor Modules

The Processor modules PM632, PM633 and PM634 for Advant Controller 110 are modules that fit into the controller subrack. They have the following characteristics:

Table 4-2. Characteristics of the AC 110 Processor Modules

	PM632	**PM633**	**PM634**
Processor	MC68000, 16MHz	MC68340, 25MHz	MC68340, 25MHz
User Flash PROM	512 kbytes	1024 kbytes	1024 kbytes
System Flash PROM	512 kbytes	1024 kbytes	1024 kbytes
RAM	512 kbytes	1024 kbytes	1024 kbytes
Used positions in subrack	1	1	2
Max. size of application program	220 kbytes	720 kbytes	720 kbytes
Battery backup time	20 weeks		
Basic communication ports	Two RS-232-C ports dedicated for connection of Advant Station 100 Series Engineering Stations and for connecting an local operator panel via MODBUS protocol or for RCOM/RCOM+ communication		
Extended communication ports	-	-	One RS-485 port for PROFIBUS-DP communication

The Flash PROM is nonvolatile memory that is used to hold the user built application (User Flash PROM) and the system software (System Flash PROM). At start-up the application is copied from the nonvolatile memory into RAM memory where it is executed. The memory is not expandable. The battery modules power the internal RAM memory and the real time clock.

4.4 Communication Interfaces

Various buses according to Table 4-3 can be connected to Advant Controller 110.

Table 4-3. Number of buses that can be connected to Advant Controller 110

Bus type	Max number	
RCOM/RCOM+, CI532V01	4	Total Max 4
MODBUS I, CI532V02	4	
Siemens 3964(R), CI532V03	4	
PROFIBUS-DP (build-in interface on PM634)	1	
MasterFieldbus	4	
Advant Fieldbus 100	2	

NOTE

One CI532Vxx module provides two channels. Each channel can operate both in master and slave mode. Do not run slave mode on both channels simultaneously.

Communication interfaces are realized as modules or submodules. A submodule is a small board which fits into a slot on the submodule carrier, SC610. Modules can be exchanged while the system is running. New modules can also be inserted live. Every unit has a red LED to indicate fault.

Table 4-4. Communication interfaces

Consists of	Description
CI626	Advant Fieldbus 100, with built-in modem for coaxial cable, does not support redundant media
CI626V1	Advant Fieldbus 100, with built-in modem for coaxial cable, supports redundant media
CI627	Advant Fieldbus 100, with built-in modem for twisted pair cable
CI670	MasterFieldbus interface (slave) 375 kbit/s, bus length = max. 25 m (82 ft.) without modems
CI671	MasterFieldbus interface (master) 375 kbit/s or 2 Mbits/s, bus length = max. 25 m (82 ft.) without modems

The purpose of the submodule carrier is to carry communication interfaces. The submodule carrier has the following characteristics.

Table 4-5. Submodule carrier and its communication interfaces

Consists of	Description
SC610	Submodule carrier, required for connection of CI532Vxx. Two submodules fits into one carrier
CI532V01	RCOM/RCOM+ communication. Each interface holds two buses
CI532V02	MODBUS communication. Each interface holds two buses
CI532V03	Siemens 3964(R) communication. Each interface holds two buses

4.5 I/O system

4.5.1 S600 Local I/O

A range of I/O modules is available, covering analog and digital signals of various types. In addition, there are modules for temperature measurement, pulse counting and position measurement applications. The process signals are connected to the front of the I/O modules. The I/O system of Advant Controller 110, S600 I/O, is modular and may consist of up to 75 I/O modules. Maximum I/O signals for an Advant Controller 110 is 1500 (includes S600 I/O and S800 I/O).

The following S600 I/O modules are supported:

Table 4-6. S600 I/O modules supported by Advant Controller 110

Module type	Type designation
AI	AI610, AI620, AI625, AI630, AI635
AO	AO610, AO650
DI	DI610, DI620, DI621, DI622, DI635, DI636, DI650, DI651, DI652
DO	DO610, DO620, DO625, DO630
Pulse Counter	DP620

I/O modules may be exchanged during system operation. The process signals are disconnected by removing the front connector. A newly inserted module is automatically put into operation if the system identifies the module as being of the correct type and without faults. I/O stations may be added to further extend the number of I/O modules connected to the system. The S600 I/O Hardware Reference Manual details the various I/O units available for Advant Controller 110. The S600 I/O Product Guide gives a first overview.

4.5.2 S800 Distributed I/O System

For applications requiring the use of distributed I/O, the full range of S800 I/O modules may be connected over Advant Fieldbus 100. These modules cover analog and digital signals of various types. The S800 I/O Hardware User’s Guide gives more details about these modules. The S800 I/O Product Guide gives a first overview.

The following S800 I/O modules are supported:

Table 4-7. S800 I/O modules supported by Advant Controller 110

Module type	Type designation
FCI	CI810V1
AI	AI810, AI820, AI830, AI835
AO	AO810, AO820
DI	DI810, DI811, DI820, DI821
DO	DO810, DO820

4.6 Power Supply

Advant Controller 110 can be connected to the following types of primary power supply:

- 120V or 230V a.c., 47 to 450Hz, using the power supply module SA610.
- 110V/125V or 220V/250V d.c., using the power supply module SA610.
- 24V d.c., direct supply to the Advant Controller 110 from an external power supply.

The electronic circuits of the modules are feeded by means of two redundant power rails. The 0 V level is connected to the metallic part of the subrack.

Table 4-8. Station voltage specifications

Description	Value
Nominal voltage	24 V d.c.
Acceptable voltage range	19.2…30 V d.c.
EMI protection level	none (the station voltage must be filtered)

We recommend you to use the power supply module SA610. It is housed in the standard module enclosure and occupies one position in the subrack. SA610 provides reinforced primary voltage isolation and buffering of short (10 ms for 110 V d.c. input and 20 ms for 230V a.c. input) primary voltage drop out. It is capable of powering a typical station consisting of one or two subracks. If one SA610 is not sufficient, two can be used in parallel.

Advant Controller 110 can be powered from an external 24V d.c. power source (without SA610). You must follow the EMC directives.

All available power supply solutions are listed in the Ordering chapter.

Chapter 5 Mechanical Design

Mechanically Advant Controller 110 consists of subracks, cable ducts, modules and process connectors.

The mechanical design of the S600 - and S800 I/O modules are described in detail in two separate Product Guides.

The subracks and cable duct are designed for wall mounting.

The 10-position controller subrack, RF615, is the primary subrack. It provides dedicated positions for CPU, communication and bus extender modules. There is a two-digit thumbwheel switch for setting the station address. The individual module address is given by its position in the subrack.

The bus connector links the controller subrack to an optional extension subrack via a bus cable (TK612). The 10-position extension subrack, RF620, extends the number of I/O modules of a station. The individual module address is given by its position in the subrack

The cable duct, RC610, holds the process cables. It also provides ten screw terminals for connecting the cable shields of process cables to ground.

Figure 5-1 shows the physical layout and Figure 5-2 the dimensions of a fully equipped subrack with cable duct.

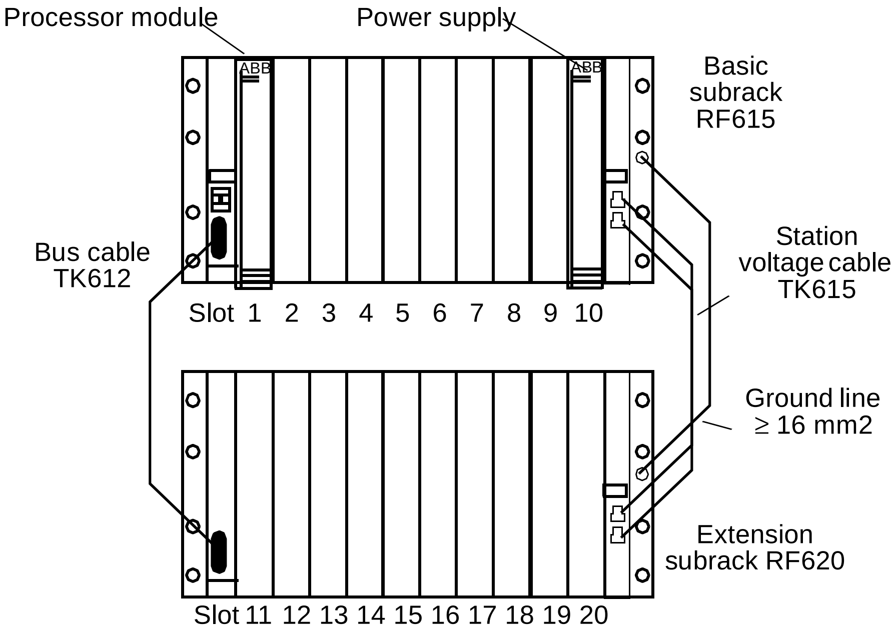

Figure 5-1. Physical layout of subrack

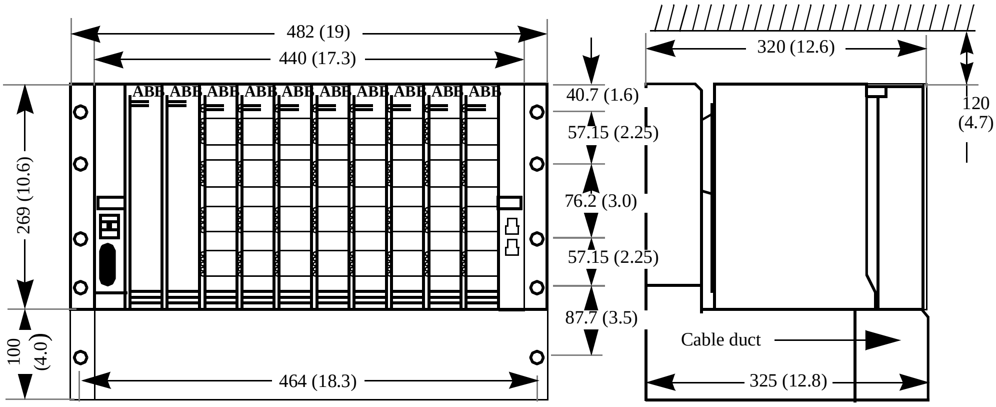

Figure 5-2. Dimensions of subrack and cable duct

Advant Controller 110 can be delivered as separate subracks for mounting in any suitable cabinet but it can also be delivered in standard RM500 cabinets, please refer to chapter 8, Ordering.

The cabinets chapter in the *Product Guide for Advant OCS with Master software, Overview,* or for details in AC 110 the *Advant Controller 110 User's Guide* give the full information for mounting Advant Controller 110 in cabinets.

Chapter 6 Technical Data and Performance

6.1 General Data

General data for the Advant Controller 110 is given in Table 6-1.

Table 6-1. The maximum configuration of Advant Controller 110

Item	Max. no.
I/O signals	1500(1)
S600 I/O modules	75(1)
Basic units	1
Subrack per basic unit	2
S600 I/O stations	7
Subracks per I/O station	2
S800 I/O stations connected to AF 100	32
S800 I/O modules per I/O station	24(2)
Advant Fieldbus 100 communication modules (CI626 or CI627)	2
MasterFieldbus slave modules (CI670)	4
MasterFieldbus master modules (CI671)	4
CPU modules (PM632, PM633 or PM634)	1 (3)
Submodule carrier module (SC610)	1 (4)

(1) These limits are not hard but practical ones (includes S600 I/O and S800 I/O)
(2) Without optional Modulebus expansion, the maximum number is 12.
(3) Must be put into the controller basic subrack (position 1).
(4) SC610 can hold up to two MVI modules.

6.2 Communication

6.2.1 Data Set Communication

Data set elements hold references to DAT elements. Up to eight DAT elements can be connected to one data set. A DAT element can hold one variable representing:

- 32 Booleans (32 bits) or 1 real number (32 bits) or
- 1 long integer number (32 bits) or 2 short integer number (16 bits).

The data set communication service cyclically transfers information from the DAT elements specified in the sending controller to the DAT elements specified in the receiving controller. The cycle time for each data set can be selected from the range 1 ms to 4096 ms.

The data set communication service is based on the broadcast principle, allowing any station to receive any data set sent on the bus. The advantage of broadcasting is that information only needs to be transmitted once regardless of the number of receiving stations. This principle is highly efficient when the same information is required in two or more stations, especially in time-critical applications.

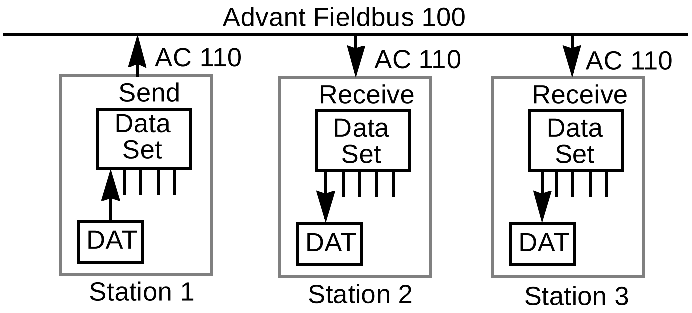

Figure 6-1. Data Set communication

The data set communication uses resources on Advant Fieldbus 100, in the communication modules and also in the CPU. Table 6-3 summarizes the load caused by Advant Fieldbus 100 on each Advant Controller 110.

Table 6-2. Data set communication (per controller)

Description	Data
Total number of data sets	400(1)
Maximum number of data sets per AF 100	200(1)
DAT elements per data set	1…8
Selectable cycle times	1,2,4…4096 ms

(1) When using S800 I/O modules, the number of usable data set is reduced

Advant Fieldbus 100 runs at 1.5 Mbits/s. Table 6-3 shows the transfer time for one data set.

Table 6-3. Data set transfer times for Advant Fieldbus 100

Data set size (DAT element per data set)	Transfer time Ttr (ms)
1	0.088
2	0.108
4	0.156
8	0.252

Use the following formula to estimate the bus load for a given application:

Bus load in% = ((N x Ttr) / Tc) x 100%, where:

N = the number of data sets (of the same size and Tc)
Ttr = the transfer time in ms (from the above table)
Tc = desired cycle time in ms (1, 2, 4, 8, 16…4096)

The resulting load should not exceed 80%, the remaining capacity must be reserved for background communication (for example, remote programming).

NOTE

Only the sending data sets are to be included in the calculation.

6.2.2 MasterFieldbus Communication with Controllers

Advant Controller 110 communicates with Advant Controller 400 Series through MasterFieldbus, using the AMPL elements MFB-IN and MFB-OUT.

The capacity of the MFB-IN (or MFB-OUT) element is 38 bytes. You can use any combination of the following variables (up to the limit of 38 bytes):

0... 9x 32 Booleans (4 bytes)

0... 9x 1 real number (4 bytes)

0... 9x 1 long integer number (4 bytes)

0...19x 1 short integer number (2 bytes).

One pair of MFB-IN and MFB-OUT occupies one node address on MasterFieldbus. An Advant Controller 110 can occupy one or several addresses. The total number of node addresses on one MasterFieldbus is 16.

Table 6-4. Data communication on MasterFieldbus with controllers

Description	Maximum No.
Number of nodes per MasterFieldbus	16
Number of node addresses per AC 110	16
Example of max. data exchange per node address: to Advant Controller 400 Series from Advant Controller 400 Series	 8 real numbers and 32 Booleans 8 real numbers and 32 Booleans
Max. cycle time (16 nodes)	54 ms
Transmission speed	375 kBit/s

6.2.3 MasterFieldbus Communication Slave Nodes of type TYRAK or SAMI

Advant Controller 110 communicates with converters of type TYRAK through MasterFieldbus, using the AMPL elements COM-CVI1 and COM-CVO1.

One pair of COM-CVI1 and COM-CVO1 occupies one node address on MasterFieldbus. An Advant Controller 110 can occupy one or several addresses. The total number of node addresses on one MasterFieldbus is 16.

Table 6-5. Data communication on MasterFieldbus with slave nodes of type TYRAK or SAMI

Description	Maximum No.
Number of nodes per MasterFieldbus	16
Number of buses per Advant Controller 110	4
Transmission speed	375 kBit/s or 2MBit/s

6.2.4 RCOM/RCOM+ Communication

An MVI channel may act as master or slave. In case of master operation it can have up to 25 slaves. Data between master and slave station is transferred using MVB elements (MVI data block) which is similar to data set elements. MVB elements hold references to DAT elements. One to eight DAT elements can be connected to one MVB with RCOM. RCOM supports 1 to 8 DAT’s and RCOM+ supports 1 to 24 DAT’s.

Table 6-6. Data communication on RCOM/RCOM+

Description	Maximum No.
Number of nodes per MVI channel	25 (1)
Number of RCOM/RCOM+ networks per AC 110 master	4
Number of slaves per AC 110	50
Number of MVBs per AC 110	500
Number of MVBs per MVI channel	340

(1) The maximum number of event generating slaves in an AC 110 network is limited to 16.

Table 6-7. Transmission of MVB using MVI, the resulting system load is a function of transmission speed, cycle time and the number of MVBs on PM632.

Transmission Speed	**Transmission of MVB with 8 DATs per second**	**Resulting system load with maximum number of MVBs at specified cycle time**	
		Cycle time of MVBs=12.8 s	**Cycle time of MVBs=102.4 s**
19200 bit/s	4.3	8% (55 MVBs)	66% (441 MVBs)
9600 bit/s	3.8	7% (48 MVBs)	58% (347 MVBs)
4800 bit/s	3.0	6% (39 MVBs)	47% (311 MVBs)
2400 bit/s	2.0	4% (26 MVBs)	32% (214 MVBs)
1200 bit/s	1.3	3% (17 MVBs)	21% (139 MVBs)

Table 6-8. Transmission of MVB using OPT5, the resulting system load is a function of transmission speed, cycle time and the number of MVBs on PM632.

Transmission Speed	**Transmission of MVB with 8 DATs per second**	**Resulting system load with maximum number of MVBs at specified cycle time**	
		Cycle time of MVBs=12.8 s	**Cycle time of MVBs=102.4 s**
9600 bit/s	3.8	37% (48 MVBs)	64% (347 MVBs)
4800 bit/s	3.0	20% (39 MVBs)	45% (311 MVBs)
2400 bit/s	2.0	11% (26 MVBs)	28% (214 MVBs)
1200 bit/s	1.3	6% (17 MVBs)	17% (139 MVBs)

6.2.5 PROFIBUS-DP Communication

The PM634 is installed in the basic station of the Advant Controller 110. It is equipped with one PROFIBUS-DP master interface which allows to use PROFIBUS I/O devices as distributed I/O. The setup of this link is defined by a number of database elements. The PROFIBUS link forms a local control network within the Advant system with the network numbers 1 to 9. Each I/O device may have a number from 1..125. The PROFIBUS-DP address 0 is reserved for the PROFIBUS-DP master.

Table 6-9. Data communication on PROFIBUS-DP

Description	Maximum No.
Number of buses per PM634	1
Number of slaves per bus	125
Number of nodes(1) per segment	32

(1) A node is a PROFIBUS slave or the repeater for a segment.

The maximum distances that can be covered with PROFIBUS-DP depend on the used transmission speed:

Table 6-10. Distance based on transmission speed on PROFIBUS-DP

Transmission Speed (kbit/sec)	Distance/Segment (m)
9.6	1200
19.2	1200
93.75	1200
187.5	1000
500	400
1500	200
12000	100

6.3 Event Transfer and Detection

Events can be detected via DI65x, by extended DB elements, or as calculated DI or AI events. After the detection of an event in Advant Controller 110, the event can be transferred via RCOM/RCOM+ or Advant Fieldbus 100 to an Advant Controller 410/450 or to AdvaSoft for Windows for further treatment. For each event queue (DB element EVS(T) or EVS(S) in the Advant Controller 110), up to 10 nodes on the Advant Fieldbus 100 network can be assigned to receive this event message. The relative time errors between events detected in different Advant Controller 110 within the same bus is <15 ms. For more information about event transfer and detection, see Table 6-11.

Table 6-11. Event transfer and detection

Description	Maximum No.
Number of event queues per Advant Controller 110	32
Number of entries per event queue	1000
Number of event set elements per Advant Controller 110	32

Table 6-11. Event transfer and detection (Continued)

Description	Maximum No.
Number of event detection elements per event set element	32
Total number of event detection elements per Advant Controller 110	512
Number of event generating slaves	16

Table 6-12. Event transfer and detection resolution

Description	Minimum.
Resolution of calculated events	10 ms
Resolution of events from digital inputs (DI650)	1 ms

6.4 Interface for a Local Operator Station

The Advant Controller 110 CPU module includes an asynchronous serial interface (channel 2), which may be used for communication with an IBM PC-based HMI (Human Machine Interface) package. In Advant Controller 110 data is exchanged, with, for example, the HMI package, by means of PARDAT elements. The supported communication protocol on this serial interface is the MODBUS I protocol (RTU, binary mode). The serial interface on the CPU can only be used as a slave with the fixed address 1 on MODBUS.

The number of MODBUS I commands that can be exchanged via the serial interface is depending on the type of command and also on the load of the CPU. You can use Table 6-13 to estimate the performance on PM632.

Table 6-13. Performance, bit oriented commands

Function code	Number of bits	Commands/s at 80% system load	Commands/s at 40% system load
01 and 02	8	26.3	50
01 and 02	256	5.6	12.8
01 and 02	2000	0.9	2.1
05	1	26.3	45.4
15	8	22.2	40
15	496	2.8	6.7
15	1968	0.7	1.9

Table 6-14. Performance, word oriented commands

Function code	Number of words	Commands/s at 80% system load	Commands/s at 40% system load
03 and 04	1	26.3	55.5
03 and 04	16	10	17.2
03 and 04	125	2.1	3.1
06	1	26.3	45.4
16	1	22.7	41.6
16	60	3.6	5.8
16	123	1.9	3.1

6.5 Cycle and Scan Times

An Advant Controller 110 application program consists of one AMPL program (PCPGM) which can be further divided into a maximum of 31 execution modules (CONTRM, MASTER) or sequence modules (SEQ). Different cycle-times and priorities may be assigned to the execution modules so that the AMPL program can include both fast and slow control functions. Cycle times can be chosen from the range 2 ms - 20 s in steps of 2 ms.

Control modules with shorter cycle times always have a higher priority than those with longer cycle times. The execution order of modules with equal cycle times can be selected explicitly. Activation at cold start or warm start can be chosen by the CONTRM´s call parameter C2.

6.6 I/O Scanning

Scanning of I/O modules is directly related to the cycle time of the execution module.

Each execution module reads its inputs before execution of its AMPL elements. This guarantees a consistent image of the process signals. After execution of the AMPL elements, the module writes the calculated results to the outputs.

6.7 CPU Load Calculation

To determine the CPU load for an Advant Controller 110, the following points should be considered:

1. 25% of the total available CPU capacity should be reserved for basic system functions.
2. The remaining 75% CPU capacity is available for the application program.

The formula for calculating the load is:

Load in% = ((N x T)/ Tc) x 100%, where

N = number of functions, T = function execution time (ms), Tc= function cycle time (ms).

The following table gives some typical execution times to use for load approximations. The figures are primarily intended for checking whether or not a system is close to the maximum load. For detailed information about load calculations, reference is made to the manual *"PC Elements AC 100 Series Reference Manual"*.

Table 6-15. Execution times, basic processing and I/O functions

Type	**Description**	**Execution time T (ms)(1)**
Logic	1 AMPL element AND, OR, INV, XOR (with 2 inputs)	0.01(2)
Logic	1 AMPL element AND, OR (with 4 inputs)	0.02(2)
Arithmetic	1 AMPL element ADD, SUB, MUL, DIV, etc.	0.06(2)
Digital I/O	1 DB element DI or DO	0.25 (3)
Analog I/O	1 DB element for AI, PT 100 or AO	1.56 (4)
Pulse	1 DB element for pulse input, for example, frequency or position measurement	0.03

(1) Mean value
(2) Value for PM632; Values for PM633 and PM634 are about 50% less
(3) 32 DI/DO signals
(4) 32 AI/AO signals

Table 6-16. Execution time of regulator function on PM632

Type	**Description**	**Execution time T (ms)**
PI loop	A simple analog control loop consisting of: - 2 DB elements AI/AO; 32 AI/AO signals - 1 AMPL element PI - 4 AMPL elements arithmetic/logic	2.1

6.8 CPU Load Calculation, Data Set Communication

You can estimate the CPU load from data set communication from the example in Table 6-17.

Table 6-17. CPU load on PM632 from data set communication

Data set size (bytes)	Data sets/s	Load on sending controller(1)	Load on sending controller (worst case)	Load on receiving controller	Load on receiving controller (worst case)
2	4	0.018%	0.07%	0.01%	0.04%
16(2)	4	0.035%	0.14%	0.02%	0.08%
2	16	0.07%	0.28%	0.038%	0.15%
16	16	0.14%	0.56%	0.075%	0.30%

(1) Optimized example: Scan factor with 512 ms and PCPGM with 64 ms.
(2) Applies to the data types IL, B and R

6.9 Memory Requirements

The available memory space for application programs differs for the processor modules.

Table 6-18. Available memory

Processor Module	Memory
PM632	220 KB
PM633	720 KB
PM634	720 KB

Use the following table for a rough calculation of the application memory requirements.

Table 6-19. Memory requirements for 7 different application programs

Program No.	Program description	Input/Output Data Set	Needed memory size (kbytes)
1	1 CONTRM with 16 x 3 input AND	48 inputs 16 outputs	3.25
2	1 CONTRM with 32 x 2 input AND	64 inputs 32 outputs	3.75
3	1 CONTRM with 32 x 2 input AND + 1 CONTRM with 16 x 2 input ADD	96 inputs 48 outputs	6.0

Table 6-19. Memory requirements for 7 different application programs (Continued)

Program No.	**Program description**	**Input/Output Data Set**	**Needed memory size (kbytes)**
4	5 CONTRM each with 32 x 2 input AND	320 inputs 160 outputs	12.0
5	2 CONTRM each with 16 x 2 input ADD + 15 CONTRM each with 32 x 2 input AND	1024 inputs 512 outputs	37.5
6	As 3 plus 1 CONTRM with each 5 x 4 inputs and outputs via AF100	96 inputs 48 outputs 10 Data Sets [each DS with 4 DATs)	8.6
7	As 3 plus 1 CONTRM with each 50 x 4 inputs and outputs via AF100	96 inputs 48 outputs 100 Data Sets [each DS with 4 DATs)	19.1

Chapter 7 Environmental Immunities

7.1 Environmental Considerations

General

The Advant Controller 110 is designed for a demanding industrial environment. Alternative cabinetry is available for different degrees of protective rating (IP21, IP41, IP54). Interference from electrical sources is suppressed by a suitable solid design and particular installation rules. The building where the system is to be stored or installed should provide an environment such that established environmental conditions are not normally exceeded.

The environmental conditions which Advant Controller 110 are designed to withstand, during storage and transport as well as during operation, are specified in a separate environmental data sheet. Limit values are given to: Corrosive gases, Temperature, Vibration, Moisture, Electro-Magnetic Compatibility, etc.

For further information about the environmental immunity, please refer to the Environmental Immunities chapter in the *Product Guide for Advant OCS with Master software, Overview.*

Temperature

It is important to note the temperature within cabinets and in the surrounding environment and atmosphere. Lower temperatures mean increased system reliability and availability.

The lives of wet, electrolytic capacitors and most semiconductors are greatly reduced if the maximum permitted temperatures are exceeded.

To avoid overheating, when ambient temperatures are high, take into consideration the heat dissipated in the cabinet. This is particularly important with sealed cabinets (IP54) with considerable number of circuit boards and ambient temperatures at levels approaching 40°C. It might be necessary to mount heat exchangers on the cabinet to bring down the temperature to levels below limits given in the environmental data sheet.

The different hardware modules in the controller and the I/O system have different outputs of heat. Accurate calculation of the heat produced by the system requires knowledge of the modules and the work cycle.

Maximum permitted temperature above the subracks in the cabinet is 55°C.

NOTE

There is normally no requirements for fans in an Advant Controller 110.

Chapter 8 Ordering

8.1 Price List Structure

Depending on the desired I/O configuration one or several price lists must be used when ordering an Advant Controller 110 with local S600 I/O or distributed S800 I/O.

Advant Controller 110 with S600 I/O (3BSE014325)

See this Product Guide and the S600 I/O Product Guide

One copy of this price list must always be used since it contains the controller.

S800 I/O (3BSE007526)

See the S800 I/O Product Guide

S800 I/O can only be ordered as separate parts. Use only one copy of the price list.

8.2 Assembled Delivery or Loose Part Delivery

The item **Assembly and test** in Table 8-1 determines if the controller shall be mounted in cabinets or not. If this item is not ordered the delivery will be a loose part delivery.

Note also that in Table 8-1 the items for CE-marking are different for an assembled delivery and for a loose part delivery.

8.3 Loose Part Delivery and CE-marking

If an Advant Controller 110 is ordered as a loose part delivery and the intention is to mount the equipment in other cabinets than RM500, certain considerations must be taken to make it follow the provisions of the EMC Directive 89/336/EEC and Low Voltage Directive 73/23/EEC.

- The cabinet or series of cabinets mounted side by side must be radio-proof.
- Protection against line conducted radio emissions is obtained by means of a mains net filter placed in the cabinet close to the incoming mains cable.
- Communication cable shields must have a capacitive grounding at the point where they enter the cabinet.

The conditional EC - Declaration of Conformity, which accompanies the loose part delivery, must be signed by the person responsible for assembling the controller in cabinets.

8.4 Reference Guide

Price List 3BSE014325

8.4.1 General Requirements

Table 8-1. General and Normative Requirements

Description	Consists of	Article No.
CE-marking, Cabinet Mounted Delivery	EC Declaration of Conformity Mains Filter	3BSE009129R0001
CE-marking, Loose Parts Delivery	Conditional EC Declaration of Conformity	3BSE009130R0001
Assembly and test of subracks		3BSE016033R0001

8.4.2 Basic Unit

Table 8-2. Basic unit

Description	Consists of	Article No.
Advant Controller 110, Basic unit consisting of:		3BDS005409R0001
- Subrack	RF615	
- Cable duct	RC610	
- Basic software	BASE on 3.5” disk	
- Support for CI532 and SC610	OPT2 on 3.5” disk	
- Event handling	OPT3 on 3.5” disk	

Table 8-3. Processor Modules

Description	Consists of	Article No.
Processor module	PM632	3BSE005831R0001
Processor module	PM633	3BSE008062R0001
Processor module	PM634	3BDS004189R0001

8.4.3 Software Options

Table 8-4. Software options

Description	Consists of	Article No.
OPT1, Extended PC Elements Software Option 1, extended AMPL element set	Software on 3.5” disk	3BDS005410R0001
OPT4, MODBUS I Software Option 4, MODBUS I protocol for MMI communication using the processor module	Software on 3.5” disk	3BDS005411R0001
OPT5, RCOM Driver Software Option 5, RCOM/RCOM+ communication protocol using the processor modules	Software on 3.5” disk	3BDS005412R0001
EXT, System software extension diskette including: - interface library - extension loader - manual	Software on 3.5” disk	3BDS005413R0001

8.4.4 Hardware Options

Table 8-5. Hardware options

Description	Consists of	Article No.
Dummy module	RB601	3BSE002803R0001
Lithium battery for backup of RAM and clock on PM632	SB610	GJR5146300R0001
Lithium battery for backup of RAM and clock on PM633 and PM634		4943 013-6
I/O Fan unit 24 V	RC620	3BSE003097R0001

8.4.5 S600 I/O, Overview

Table 8-6. S600 I/O station

Description	Consists of	Article No.
I/O station	Subrack RF615, Cable duct RC610 Bus extender CI610	3BSE000650R0001
I/O extension kit	Subrack RF620, Cable duct RC610 Bus cable TK612, Pwr. cable TK615	3BSE000649R0001
I/O bus extension kit	Bus extender CI615 for base station Bus terminator TC610 for I/O extension bus	3BSE000756R0001

Table 8-7. S600 I/O Analog Input Modules

Description	Consists of	Article No.
32 channels, 12 bits resolution, single ended, 0-20 mA, shunt 250 Ω	AI610	3BHT300000R0001
16 channels, 12 bits resolution, differential, 0-20 mA, 4-20 mA, ±20 mA or ±10 V, shunt 250 Ω, CMV 100 V, CMRR>80 dB (16 2/3, 50 or 60 Hz)	AI620	3BHT300005R0001
16 channels, 12 bits resolution, galvanic isolated as one group, 0-20 mA, CMV 50 V, CMRR>100 dB, Shunt 100 Ω.	AI625	3BHT300036R0001
12 channels for Pt100 or resistance, 3- or 4-wire (2 wire with extra wiring om process connector), 13 bits resolution, -200 to +600°C or 0-500 Ω, 0.5 V, CMRR>100 dB, opto-isolated as one group	AI630	3BHT300011R0001
14 channels for thermocouple or millivolts and 2 channels for ambient (CJ) temperature measurement with Pt100, 12 bits resolution, CMRR>120 dB, opto-isolated as one group	AI635	3BHT300032R0001

Table 8-8. S600 I/O Analog Output Modules

Description	Consists of	Article No.
16 channels, 12 bits resolution, 0-20 mA, 0-10 V, opto-isolated as one group	AO610	3BHT300008R0001
8 channels, 12 bits resolution, 0-20 mA, 4-20 mA, ±20 mA 0-5 V, 0-10 V, 1-5 V, ±10 V, each channel opto-isolated	AO650	3BHT300051R0001

Table 8-9. S600 I/O Digital Input Modules

Description	Consists of	Article No.
32 channels, 24 V d.c., non-isolated	DI610	3BHT300004R0001
32 channels, 24 V d.c., opto-isolated in four groups	DI620	3BHT300002R0001
32 channels, 48 V d.c., opto-isolated in four groups	DI621	3BHT300012R0001
32 channels, 60 V d.c., opto-isolated in four groups	DI622	3BHT300013R0001
16 channels, 120 V a.c., opto-isolated in four groups	DI635	3BHT300015R0001
16 channels, 230 V a.c., opto-isolated in four groups	DI636	3BHT300014R0001
32 channels, 24 V d.c., opto-isolated in four groups, sequence of event or pulse catching capability	DI650	3BHT300025R0001
32 channels, 48 V d.c., opto-isolated in four groups, sequence of event or pulse catching capability	DI651	3BHT300026R0001
32 channels, 60 V d.c., opto-isolated in four groups, sequence of event or pulse catching capability	DI652	3BHT300027R0001

Table 8-10. S600 I/O Digital Output Module

Description	Consists of	Article No.
32 channels, 24 V d.c., short-circuit proof transistors, max. 200 mA, non-isolated	DO610	3BHT300006R0001
32 channels, <60 V d.c., short-circuit proof transistors, max. 0.5 A, opto-isolated in four groups	DO620	3BHT300009R0001
16 channels, 24 V d.c., short-circuit proof transistors, max. 2.4 A, non-isolated in eight groups	DO625	3BHT300040R0001
16 channels, 24-250 V a.c./d.c., relay contacts. (1)	DO630	3BHT300007R0001

(1) Relay data Load current: max 2 A min 20 mA Breaking Capacity: a.c. max 500 VA d.c. max 40 W

Table 8-11. S600 I/O Pulse Counting Modules

Description	Consists of	Article No.
5 counter channels, each with two counter inputs, max 100 kHz and one Strobe and one Set input, ±13 mA, 24 V d.c. or 5 V d.c. (only 24 V for Set), each input individually opto-isolated, connection via 15 Pin Sub-D for each channel. Operation modes: 1. Up- & down- counting 2. Frequency & difference measurement 3. Difference measurement 4. Position & rotational speed measurement	DP620	3BHT300016R0001
Cable Kit for DP620	TX620 TK620V030	3BSE009963R0001

Table 8-12. Cables and connectors

Description	Consists of	Article No.
Front connector with screw terminals	TF620	3BHT100013R0001
Process cable w. fitted connector TF610, unscreened, l = 3 m (9.8 ft.)	TK630V030	3BSC950007R0001
Process cable w. fitted connector TF610, unscreened, l = 5 m (16 ft.)	TK630V050	3BSC950007R0002

Table 8-12. Cables and connectors

Description	Consists of	Article No.
Process cable w. fitted connector TF610, unscreened, l = 10 m (32.8 ft.)	TK630V110	3BSC950007R0003
Process cable w. fitted connector TF610, screened, l = 3 m (9.8 ft.)	TK640V030	3BSC950008R0001
Process cable w. fitted connector TF610, screened, l = 5 m (16 ft.)	TK640V050	3BSC950008R0002
Process cable w. fitted connector TF610, screened, l = 10 m (32.8 ft.)	TK640V110	3BSC950008R0003
Terminal unit one per I/O module is required	TX650	3BSC840005R0001
Mounting bar for terminal unit	RA620	2166 0559-F
Cable from base to I/O station, 2.5 m (8 ft.)	TK610V025	3BHT200007R0001
Cable from base to I/O station, 5 m (16 ft.)	TK610V050	3BHT200008R0001
Cable from base to I/O station, 10 m (32 ft.)	TK610V110	3BHT200009R0001

8.4.6 Communication

Table 8-13. Multi Vendor Interface

Description	Consists of	Article No.
MVI, Multi Vendor Interface with RCOM/RCOM+ protocol. It provides two buses	CI532V01	3BSE003826R0001
MVI, Multi Vendor Interface with MODBUS protocol. It provides two buses	CI532V02	3BSE003827R0001
MVI, Multi Vendor Interface with Siemens 3964(R) protocol. It provides two buses	CI532V03	3BSE003828R0001
Submodule carrier, required for connection of CI532. Two CI532 fit into one carrier	SC610	3BSE001552R0001

Table 8-14. Advant Fieldbus 100

Description	Consists of	Article No.
Advant Fieldbus 100 interface kit for coaxial cable	Bus interface CI626, AF 100 connector kit (for one busline only)	3BSE004006R0001
Advant Fieldbus 100 interface kit for twisted pair cable	Bus interface CI627, AF 100 connector kit (for one busline only)	3BSE009799R0001
Advant Fieldbus 100 connection kit for optical bus	Includes the needed cables and connectors to connect to optical AF 100	3BSE005544R0001
Advant Fieldbus 100 connection kit for redundant buses	Includes the needed cables and connectors to connect to redundant AF 100	3BSE005545R0001
Advant Fieldbus 100 terminator kit (1 kit reqd. per bus cable)	1 x 75 Ω BNC terminator plug 1xditto w. ground lead	3BSE006244R0001
Modem for Advant Fieldbus 100 optical link	TC630	3BSE002253R0001
Conv. Modem for Advant Fieldbus 100 twisted pair connections	TC513	3BSE006385R0001
Conv. Modem for Advant Fieldbus 100 optical connections	TC514V1	3BSE013240R0001

Table 8-14. Advant Fieldbus 100 (Continued)

Description	Consists of	Article No.
Rep. Modem for Advant Fieldbus 100 twisted pair connections	TC515	3BSE006386R0001
Terminator 150 Ohm for twisted pair cable	TC501V150	3BSC550038R0003
AF100 Trunk Tap	TC506	3BSC840074R0001

Table 8-15. MasterFieldbus

Description	Consists of	Article No.
Powered terminator for short distance bus	DSTC 404	5752 0001-DS
Passive terminator for short distance bus	DSTC 406	5752 0001-DX
Passive terminator for short distance bus (fits CI670)	TC670	3BSE000808R0001
MasterFieldbus interface (slave) 375 kbit/s, bus length = max. 25 m (82 ft.) without modems (if AC 110 is last the station on SDB, a passive terminator, TC670, also reqd.)	Module CI670	3BHT300017R0001
MasterFieldbus interface (master) 375 kbit/s or 2 Mbits/s, with or without modems, active termination built in	Module CI671	3BSE004043R0001

Table 8-16. MasterFieldbus (long distance bus)

Description	Consists of	Article No.
Modem for coaxial cable	DSTC 452	5751 017-A
Terminator for long distance bus		5217 423-14
BNC coaxial connector		5217 423-8
Inline coaxial connector		5217 423-16
Overvoltage protector	DSTC 451	5685 2000-A
Mounting bar for overvoltage protector		2172 507-749
Modem for fibre optical cable	DSTC 454L	5751 017-R

Table 8-17. MasterFieldbus (redundant)

Description	Consists of	Article No.
Multiplexer for redundant bus	DSTC 456	5751 017-L

8.4.7 Power Supply

Table 8-18. Power Supply Module

Description	Consists of	Article No.
Power supply module Input: 110/120/220/240 V a.c. or 110/220/250 V d.c. Output: 24 V, 60 W, d.c. Fits in subrack	SA610 Open-ended mains cable Connector for relay output	3BSE000655R0001

Table 8-19. Power Supply in RM500V1 Cabinets

Description	Consists of	Article No.
Power supply Kit 1 Complete **centralized** power supply. Input: **120** V a.c. Output: 24 V, 10 A, d.c.	SA161 Including power switch, mounting plate and cables	3BSE005746R0001
Power supply Kit 2 Complete **centralized** power supply. Input: *230* V a.c. Output: 24 V, 10 A, d.c.	SA162 Including power switch and cables	3BSE005747R0001
Power supply Kit 3 Additional supply for **decentralized** powering Input: 110/120/220/240 V a.c. or 110/220/250 V d.c. Output: 24 V, 60 W, d.c.	SA610 Including power switch and cables	3BSE005748R0001

Table 8-20. Power Supply in RM500V2 Cabinets

Description	Consists of	Article No.
Power supply Kit 1 Complete **centralized** power supply. Input: 120 V a.c. Output: 24 V, 10 A, d.c.	SA161 Including power switch, mounting plate and cables	3BSE007040R0001
Power supply Kit 2 Complete **centralized** power supply Input: 230 V a.c. Output: 24 V, 10 A, d.c.	SA162 Including power switch, mounting plate and cables	3BSE007041R0001
Power supply Kit 3 Additional supply for **decentralized** powering Input: 110/120/220/240 V a.c. or 110/220/250 V d.c. Output: 24 V, 60 W, d.c.	SA610 Including power switch and cables	3BSE007042R0001

Table 8-21. Power Supply for Field equipment

Description	Consists of	Article No.
Single a.c Power Supply Input: 120 V a.c., 50/60 Hz Output: 24 V, 10 A, d.c., unregulated	SA161 SX554 TK402V027	3BSE003591R0001
Single a.c Power Supply Input: 230 V a.c., 50/60 Hz Output: 24 V, 10 A, d.c., unregulated	SA162 SX554 TK402V027	3BSE003592R0001
Single a.c Power Supply Input: 120 V a.c., 50/60 Hz Output: 48 V, 5 A, d.c., unregulated	SA171 SX554 TK402V027	3BSE003593R0001
Single a.c Power Supply Input: 230 V a.c., 50/60 Hz Output: 48 V, 5 A, d.c., unregulated	SA172 SX554 TK402V027	3BSE003594R0001

Table 8-22. Main Supply Filter

Description	Consists of	Article No.
Main Supply Filter 250V, 20A		3BSC740007R0001
Main Supply Filter 250V, 55A		3BSC740008R0001
Main Supply Filter 250V, 80A		3BSC740009R0001

8.4.8 Cabinets

Table 8-23. RM500V1 Cabinets Width=800 mm (31.5”), Depth=512mm (20.2”)

Description	Consists of	Article No.
Single Cabinet ventilated IP21, height: 2125 mm (83.7”)	RM521	3BSE016063R0001
Single Cabinet ventilated IP21, height: 1925 mm (75.8”)	RM524	3BSE016066R0001
Single Cabinet ventilated IP41, height: 2125 mm (83.7”)	RM522	3BSE016064R0001
Single Cabinet ventilated IP41, height: 1925 mm (75.8”)	RM525	3BSE016067R0001
Single Cabinet sealed IP54, height: 2125 mm (83.7”)	RM523	3BSE016065R0001
Single Cabinet sealed IP54, height: 1925 mm (75.8”)	RM526	3BSE016068R0001

Table 8-24. RM500V1 Accessories

Description	Consists of	Article No.
Plate holder for front plate with customer designed text		3BSE016259R0001
End panel for RM500V1 cabinets with H=2125 mm (83.7”)		3BSE016253R0001
End panel for RM500V1 cabinets with H=1925 mm (75.8”)		3BSE016252R0001
Double door instead of single door		3BSE016260R0001

Table 8-24. RM500V1 Accessories

Description	Consists of	Article No.
Shield plate, to be used between cabinets in a row (2125 mm) (83.7”)		3BSE016256R0001
Shield plate, to be used between cabinets in a row (1925 mm) (75.8”)		3BSE016255R0001
Locking device for one door.		3BSE016258R0001

Table 8-25. RM500V2 Cabinets Width=700 mm (27.6”), Depth=637mm (25.1”), High=2225 (87.6”)

Description	Consists of	Article No.
Single Cabinet ventilated IP21	RM507	3BSE016051R0001
Single Cabinet ventilated IP21	RM537(1)	3BSE016055R0001

(1) Not verified for CE-marking

Table 8-26. RM500V2 Accessories

Description	Consists of	Article No.
End panel for RM500V2 cabinets		3BSE016254R0001
Shield plate for RM500V2 cabinets		3BSE016257R0001

8.4.9 Documentation

Table 8-27. Documentation

Title	Description	Article No.
Advant OCS User Documentation on CD-ROM	CD-ROM containing all manuals listed below in this table	3BSE008143R0701
Advant OCS Installation Rules User’s Guide	User’s Guide describing the installation rules for Advant OCS, to ensure correct function in environments where disturbance are present	3BSE009178R0001 Rev. A

Table 8-27. Documentation

Advant Controller 110 User’s Guide	User’s Guide describing the AC 110 equipment and how to install and commission the system	3BSE009131R0101
S800 I/O User’s Guide	User’s Guide describing the entire S800 I/O System equipment and how to install and commission the system	3BSE008878R0201
S600 I/O Hardware Reference Manual	Reference Manual describing the entire S600 I/O System equipment and how to install and commission the system	3BSE011123R0001 Rev. B
AMPL Configuration Advant Controller 100 Series Reference Manual	Contains instructions about configuration and application programming, fault tracing, execution, memory and load calculation of AC 110, AC 70 and AC 55	3BSE009626R0201
PC Elements Advant Controller 100 Series Reference Manual	Reference Manual describing the PC Elements used with Advant Controller 110	3BSE000504R0201
Data Base Elements Advant Controller 100 Series Reference Manual	Reference Manual describing the DB Elements used in Advant Controller 110	3BSE000505R0301
Advant Fieldbus 100 User’s Guide	Complete technical manual for AF 100, containing a technical description, technical data and instructions for installation, commissioning and fault tracing	3BSE000506R0601
Master Fieldbus and S400 I/O User’s Guide	Complete technical manual for Master Fieldbus	3BSE003837R0001
RCOM AC 100 Series User’s Guide	User’s Guide describing the complete handling of RCOM communication in AC 110	3BSE003181R0001 Rev. A
MultiVendor- Interface MODBUS AC 100 Series User’s Guide	User’s Guide describing the complete handling of MODBUS communication in AC 110 via MultiVendor Interface	3BSE006712R0001 Rev. A

Table 8-27. Documentation

MultiVendor- Interface SIEMENS AC 100 Series User’s Guide	User’s Guide describing the complete handling of Siemens 3964(R) communication in AC 110 via MultiVendor Interface	3BSE006713R0001 Rev. A
Advant Controller 110 PROFIBUS-DP User’s Guide	User’s Guide describing the complete handling of PROFIBUS-DP communication in AC 110 via PM634	3BDS100313R0001